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09/964,591	09/28/2001	Akio Matsuda	1075.1174	2406

21171 7590 02/17/2006	EXAMINER
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Please find below and/or attached an Office communication concerning this application or proceeding.

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on <u>01 December 2005</u>.

2a)☐ This action is **FINAL.**   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) <u>1-41</u> is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) <u>1-41</u> is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on <u>28 September 2001</u> is/are: a)☐ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All   b)☐ Some * c)☐ None of:

    1.☐ Certified copies of the priority documents have been received.

    2.☐ Certified copies of the priority documents have been received in Application No. _____.

    3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☐ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5)☐ Notice of Informal Patent Application (PTO-152)

6)☐ Other: _____.

DETAILED ACTION

1.   This communication is in response to the Applicants' Response mailed on

December 1, 2005. Claims 1-21, 24, 25, 27-30, 33, 34, 36-39 and 41 were amended.

Claims 1-41 of the application are pending. This office action is made non-final.

Claim Objections

2.   The following is a quotation of 37 C.F.R § 1.75 (d)(1):

> The claim or claims must conform to the invention as set forth in the remainder of the
> specification and terms and phrases in the claims must find clear support or antecedent basis in
> the description so that the meaning of the terms in the claims may be ascertainable by reference
> to the description.

3.   Claims 1- 41 are objected to because of the following informalities:

Amended Claim 1, Lines 7-10, "a resource manager which manages said hardware

resource data;

allocating a resource in which said resource manager allocates said hardware resource

data meeting said request to said thread in accordance with a rule prescribed in advance" appears

to be incorrect and it appears that it should be "a resource manager which manages said hardware

resource;

allocating a resource in which said resource manager allocates said hardware resource

meeting said request to said thread in accordance with a rule prescribed in advance".

Amended Claim 5, Lines 3-7, "with the types of said hardware resources <u>data</u> and are

hierarchized according to the dependence among said hardware resources <u>data</u>, and

in said resource allocating, the hardware resource <u>data</u> allocation is made in consideration

of the dependence between said hardware resource <u>data</u> managed by one of said resource

managers and said hardware resource <u>data</u> managed by the other resource manager" appears to

be incorrect and it appears that it should be "with the types of said hardware resources and are

hierarchized according to the dependence among said hardware resources, and

in said resource allocating, the hardware resource allocation is made in consideration of

the dependence between said hardware resource managed by one of said resource managers and

said hardware resource managed by the other resource manager".

Amended Claim 7, Lines 3-5, "said hardware resource <u>data</u> allocated by said resource

request in said requesting a resource to make a decision on a competition state in read/write

operation on said hardware resource <u>data</u> among a plurality of threads" appears to be incorrect

and it appears that it should be "said hardware resource allocated by said resource request in said

requesting a resource to make a decision on a competition state in read/write operation on said

hardware resource among a plurality of threads".

Amended Claim 8, Line 3, "with respect to said hardware resource <u>data</u> to detect a

bottleneck" appears to be incorrect and it appears that it should be "with respect to said hardware

resource to detect a bottleneck".

Amended Claim 9, Line 3, "with respect to said hardware resource <u>data</u> to detect blocking" appears to be incorrect and it appears that it should be "with respect to said hardware resource to detect blocking".

Amended Claim 12, Lines 7-10, "a resource manager which manages said hardware resource <u>data;</u>

allocating a resource in which said resource manager allocates said hardware resource <u>data</u> meeting said request to said thread in accordance with a rule prescribed in advance;" appears to be incorrect and it appears that it should be "a resource manager which manages said hardware resource;

allocating a resource in which said resource manager allocates said hardware resource meeting said request to said thread in accordance with a rule prescribed in advance;".

Amended Claim 15, Lines 5-6, "each of said resource managers allocates said hardware resource <u>data</u>" appears to be incorrect and it appears that it should be "each of said resource managers allocates said hardware resource".

Amended Claim 16, Lines 4-8, "according to the dependence among said hardware resources <u>data,</u> and

in said resource allocating, the hardware resource <u>data</u> allocation is made in consideration of the dependence between said hardware resource <u>data</u> managed by one of said resource managers and said hardware resource <u>data</u> managed by the other resource manager" appears to

be incorrect and it appears that it should be "according to the dependence among said hardware

resources, and

in said resource allocating, the hardware resource allocation is made in consideration of

the dependence between said hardware resource managed by one of said resource managers and

said hardware resource managed by the other resource manager".

Amended Claim 18, Lines 3-5, "with respect to said hardware resource data allocated by

said resource request in said resource requesting step to make a decision on a competition state in

read/write operation on said hardware resource data among a plurality of threads" appears to be

incorrect and it appears that it should be "with respect to said hardware resource allocated by

said resource request in said resource requesting step to make a decision on a competition state in

read/write operation on said hardware resource among a plurality of threads".

Amended Claim 19, Line 3, "with respect to said hardware resource data to detect a

bottleneck" appears to be incorrect and it appears that it should be "with respect to said hardware

resource to detect a bottleneck".

Amended Claim 20, Line 3, "with respect to said hardware resource data to detect

blocking" appears to be incorrect and it appears that it should be "with respect to said hardware

resource to detect blocking".

Amended Claim 24, Lines 5-6, "said hardware resource <u>data</u>" appears to be incorrect and

it appears that it should be "said hardware resource".

Amended Claim 25, Lines 5-8, "said hardware resources <u>data</u>, and

in said resource allocating, the hardware resource <u>data</u> allocation is made in consideration

of the dependence between said hardware resource <u>data</u> managed by one of said resource

managers and said hardware resource <u>data</u> managed by the other resource manager" appears to

be incorrect and it appears that it should be "said hardware resources, and

in said resource allocating, the hardware resource allocation is made in consideration of

the dependence between said hardware resource managed by one of said resource managers and

said hardware resource managed by the other resource manager".

Amended Claim 27, Lines 3-5, "said hardware resource <u>data</u> allocated by said resource

request in said resource requesting to make a decision on a competition state in read/write

operation on said hardware resource <u>data</u> among a plurality of threads" appears to be incorrect

and it appears that it should be "said hardware resource allocated by said resource request in said

resource requesting to make a decision on a competition state in read/write operation on said

hardware resource among a plurality of threads".

Amended Claim 28, Line 3, "said hardware resource <u>data</u> to detect a bottleneck" appears

to be incorrect and it appears that it should be "said hardware resource to detect a bottleneck".

Amended Claim 29, Line 3, "said hardware resource <u>data</u> to detect blocking" appears to

be incorrect and it appears that it should be "said hardware resource to detect blocking".

Amended Claim 33, Lines 5-6, "said hardware resource <u>data</u>" appears to be incorrect and

it appears that it should be "said hardware resource".

Amended Claim 34, Lines 5-8, "among said hardware resources <u>data</u>, and

in said resource allocating, the hardware resource <u>data</u> allocation is made in consideration

of the dependence between said hardware resource <u>data</u> managed by one of said resource

managers and said hardware resource <u>data</u> managed by the other resource manager" appears to

be incorrect and it appears that it should be "among said hardware resources, and

in said resource allocating, the hardware resource allocation is made in consideration of

the dependence between said hardware resource managed by one of said resource managers and

said hardware resource managed by the other resource manager".

Amended Claim 36, Lines 3-5, "said hardware resource <u>data</u> allocated by said resource

request in said resource requesting to make a decision on a competition state in read/write

operation on said hardware resource <u>data</u> among a plurality of threads" appears to be incorrect

and it appears that it should be "said hardware resource allocated by said resource request in said

resource requesting to make a decision on a competition state in read/write operation on said

hardware resource among a plurality of threads".

Amended Claim 37, Line 3, "said hardware resource <u>data</u>" appears to be incorrect and it

appears that it should be "said hardware resource".

Amended Claim 38, Line 3, "said hardware resource <u>data</u>" appears to be incorrect and it

appears that it should be "said hardware resource".

Amended Claim 41, Lines 9-10, "said hardware resource <u>data</u>" appears to be incorrect

and it appears that it should be "said hardware resource".

Claims objected but not specifically addressed are objected based on their dependency on

rejected claims.

Appropriate corrections are required.

Claim Rejections - 35 USC § 112

4.   The following is a quotation of the first paragraph of 35 U.S.C. §112:

> The specification shall contain a written description of the invention, and of the manner
> and process of making and using it, in such full, clear, concise, and exact terms as to enable any
> person skilled in the art to which it pertains, or with which it is most nearly connected, to make
> and use the same and shall set forth the best mode contemplated by the inventor of carrying out
> his invention.

5.   Claims 1-41 are rejected under 35 U.S.C. 112, first paragraph, as containing subject

matter which was not described in the specification in such a way as to reasonably convey to one

skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Amended claim 1 states, "requesting a resource in which a thread manager, which controls threads each forming an execution unit of a program, makes a request for <u>hardware resource data relating to</u> a hardware resource needed for execution of each of threads representative of a series of functions required until the operation of said logical unit reaches completion according to a design specification of said logical unit, to a resource manager which manages said hardware resource <u>data</u>;" and "said thread manager and said resource manager executing said requesting, allocating, and controlling repeatedly in cooperation with each other until the execution of said thread reaches completion while dynamically allocating <u>hardware resource data relating to</u> necessary hardware resources". There is no support for "making a request for <u>hardware resource data relating to</u> a hardware resource needed for execution of each of threads" and "dynamically allocating <u>hardware resource data relating to</u> necessary hardware resources" anywhere in the specification. This is new material added in the amendment and not found in the original specification.

Amended claim 10 states, "wherein said thread has a budget on a time of occupancy of <u>hardware resource data relating to</u> a hardware resource allocated by said resource manager". There is no support for "a budget on a time of occupancy of <u>hardware resource data relating to</u> a hardware resource allocated by said resource manager" anywhere in the specification. This is new material added in the amendment and not found in the original specification.

Amended claim 12 states, "requesting a resource in which a thread manager, which controls threads each forming an execution unit of a program, makes a request for <u>hardware resource data relating to</u> a hardware resource needed for execution of each of threads representative of functions required until the operation of said logical unit reaches completion according to a design specification of said logical unit, to a resource manager which manages said hardware resource <u>data</u>;" and "said thread manager and said resource manager executing said requesting, allocating, and controlling repeatedly in cooperation with each other until the execution of said thread reaches completion while dynamically allocating <u>hardware resource data relating to</u> necessary hardware resources to the thread by said resource manager". There is no support for "making a request for <u>hardware resource data relating to</u> a hardware resource needed for execution of each of threads" and "dynamically allocating <u>hardware resource data relating to</u> necessary hardware resources" anywhere in the specification. This is new material added in the amendment and not found in the original specification.

Amended claim 13 states, "a resource manager for managing <u>hardware resource data relating to</u> a hardware resource needed for execution of said thread", "resource requesting means for making a request for <u>hardware resource data relating to</u> a hardware resource needed for execution of a thread representative of functions required until the operation of said logical unit reaches completion according to a design specification of said logical unit, to said resource manager", "resource allocating means for allocating <u>hardware resource data relating to</u> a hardware resource meeting the request to said thread in accordance with a rule prescribed in advance" and "said thread manager and said resource manager conducting the resource request

and the control of the thread execution state repeatedly in cooperation with each other until the

execution of said thread reaches completion while dynamically allocating hardware resource data

relating to necessary hardware resources to the thread by said resource manager". There is no

support for "managing hardware resource data relating to a hardware resource needed for

execution of said thread", "making a request for hardware resource data relating to a hardware

resource needed for execution of a thread", "allocating hardware resource data relating to a

hardware resource meeting the request to said thread" and "dynamically allocating hardware

resource data relating to necessary hardware resources" anywhere in the specification. This is

new material added in the amendment and not found in the original specification.

Amended claim 14 states, "a thread manager for controlling threads each forming an

execution unit of said program and as a resource manager for managing hardware resource data

relating to a hardware resource needed for execution of each of threads", "requesting a resource

in which said thread manager makes a request for hardware resource data relating to a hardware

resource needed for execution of threads" and "said thread manager and said resource manager

executing the requesting, the allocating, and the controlling repeatedly in cooperation with each

other until the execution of said thread reaches completion while dynamically allocating

hardware resource data relating to necessary hardware resources to the thread by said resource

manager". There is no support for "a resource manager for managing hardware resource data

relating to a hardware resource needed for execution of each of threads", "requesting a resource

in which said thread manager makes a request for hardware resource data relating to a hardware

resource needed for execution of threads" and "dynamically allocating hardware resource data

relating to necessary hardware resources" anywhere in the specification. This is new material

added in the amendment and not found in the original specification.

Amended claim 15 states, "a plurality of resource managers each corresponding to said

resource manager are provided in conjunction with the types of hardware resource data relating

to hardware resources". There is no support for "a plurality of resource managers each

corresponding to said resource manager are provided in conjunction with the types of hardware

resource data relating to hardware resources" anywhere in the specification. This is new material

added in the amendment and not found in the original specification.

Amended claim 16 states, "a plurality of resource managers each corresponding to said

resource manager are provided in conjunction with the types of hardware resource data relating

to hardware resources and are hierarchized according to the dependence among said hardware

resources data". There is no support for "a plurality of resource managers each corresponding to

said resource manager are provided in conjunction with the types of hardware resource data

relating to hardware resources and are hierarchized according to the dependence" anywhere in

the specification. This is new material added in the amendment and not found in the original

specification.

Amended claim 21 states, "said thread has a budget on a time of occupancy of hardware

resource data relating to a hardware resource allocated by said resource manager". There is no

support for "a budget on a time of occupancy of hardware resource data relating to a hardware

resource allocated by said resource manager" anywhere in the specification. This is new

material added in the amendment and not found in the original specification.

Amended claim 24 states, "wherein a plurality of resource managers each corresponding

to said resource manager are provided in conjunction with the types of hardware resource data

relating to hardware resources". There is no support for "a plurality of resource managers each

corresponding to said resource manager are provided in conjunction with the types of hardware

resource data relating to hardware resources" anywhere in the specification. This is new material

added in the amendment and not found in the original specification.

Amended claim 25 states, "a plurality of resource managers each corresponding to said

resource manager are provided in conjunction with the types of hardware resource data relating

to hardware resources and are hierarchized according to the dependence among said hardware

resources data". There is no support for "a plurality of resource managers each corresponding to

said resource manager are provided in conjunction with the types of hardware resource data

relating to hardware resources" anywhere in the specification. This is new material added in the

amendment and not found in the original specification.

Amended claim 30 states, "said thread has a budget on a time of occupancy of hardware

resource data relating to a hardware resource allocated by said resource manager". There is no

support for "thread has a budget on a time of occupancy of hardware resource data relating to a

hardware resource allocated by said resource manager" anywhere in the specification. This is

new material added in the amendment and not found in the original specification.

Amended claim 33 states, "a plurality of resource managers each corresponding to said

resource manager are provided in conjunction with the types of <u>hardware resource data relating</u>

<u>to </u>hardware resources". There is no support for "a plurality of resource managers each

corresponding to said resource manager are provided in conjunction with the types of <u>hardware</u>

<u>resource data relating to </u>hardware resources" anywhere in the specification. This is new material

added in the amendment and not found in the original specification.

Amended claim 34 states, "a plurality of resource managers each corresponding to said

resource manager are provided in conjunction with the types of <u>hardware resource data relating</u>

<u>to </u>hardware resources and are hierarchized according to the dependence among said hardware

resources <u>data</u>". There is no support for "a plurality of resource managers each corresponding to

said resource manager are provided in conjunction with the types of <u>hardware resource data</u>

<u>relating to </u>hardware resources and are hierarchized according to the dependence among said

hardware resources <u>data</u>" anywhere in the specification. This is new material added in the

amendment and not found in the original specification.

Amended claim 39 states, "said thread has a budget on a time of occupancy of <u>hardware</u>

<u>resource data relating to </u>a hardware resource allocated by said resource manager". There is no

support for "said thread has a budget on a time of occupancy of <u>hardware resource data relating</u>

to a hardware resource allocated by said resource manager" anywhere in the specification. This

is new material added in the amendment and not found in the original specification.

Amended claim 41 states, "requesting a resource in which a thread manager, which

controls threads each forming an execution unit of a program, makes a request for hardware

resource data relating to a hardware resource needed for execution of each of threads

representative of functions required until the operation of said logical unit reaches completion

according to a design specification of said logical unit, to a resource manager which manages

said hardware resource data;" and "said thread manager and said resource manager executing the

requesting, the allocating, and the controlling repeatedly in cooperation with each other until the

execution of said thread reaches completion while dynamically allocating hardware resource data

relating to necessary hardware resources to the thread by said resource manager every time the

generated thread is executed, simulating the operation of said logical unit to be conducted up to

the completion". There is no support for "making a request for hardware resource data relating

to a hardware resource needed for execution of each of threads ", and "dynamically allocating

hardware resource data relating to necessary hardware resources to the thread by said resource

manager" anywhere in the specification. This is new material added in the amendment and not

found in the original specification.

Claims rejected but not specifically addressed are rejected based on their dependency on

rejected claims.

Claim Rejections - 35 USC § 103

6.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

7.   The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459

(1966), that are applied for establishing a background for determining obviousness under 35

U.S.C. 103(a) are summarized as follows:

1.   Determining the scope and contents of the prior art.
2.   Ascertaining the differences between the prior art and the claims at issue.
3.   Resolving the level of ordinary skill in the pertinent art.
4.   Considering objective evidence present in the application indicating obviousness or nonobviousness.

8.   Claims 1, 3, 6, 13, 14, 17, 32 and 35 are rejected under 35 U.S.C. 103(a) as being

unpatentable over **Chen** (U.S. Patent 6,466,898) in view of **Dearth et al.** (U.S. Patent

6,345,242), and further in view of **Dearth et al.** (U.S. Patent 5,812,824) and **Levy et al.** (U.S.

Patent 6,092,175).

8.1   **Chen** teaches multithreaded, mixed hardware description language logic simulation on

engineering workstations. Specifically as per claim 1, **Chen** teaches a method of simulating an

operation of a logical unit (CL1, L1-3; CL1, L12-15; CL3, L10-11; CL3, L18-20).

Chen teaches a thread manager, which controls threads each forming an execution unit of

a program, for execution of each of threads representative of a series of functions required until

the operation of the logical unit reaches completion according to a design specification of the

logical unit (Fig 8 and Fig. 11). Chen does not expressly teach requesting a resource in which a

thread manager makes a request for hardware resource data relating to a hardware resource

needed for execution of each of threads, to a resource manager which manages the hardware

resource data. Dearth et al. ('242) teaches requesting a resource in which a thread manager

makes a request for hardware resource data relating to a hardware resource needed for execution

of each of threads, to a resource manager which manages the hardware resource data (Fig. 2,

Item 202 and Item 130; Abstract L17-20). It would have been obvious to one of ordinary skill in

the art at the time of Applicants' invention to modify the method of Chen with the method of

Dearth et al. ('242) that included requesting a resource in which a thread manager makes a

request for hardware resource data relating to a hardware resource needed for execution of each

of threads, to a resource manager which manages the hardware resource data because as per

Dearth et al. ('824), when simulating a circuit using multiple concurrently executing threads,

often more than one thread would attempt to interact with the same simulated component of the

simulated circuit or device; and it would be necessary to avoid collisions in multiple concurrently

executing threads by reserving simulated devices to one or more simulation threads (CL2, L30-

33; Abstract, L1-3; CL4, L32-36).

Chen does not expressly teach allocating a resource in which the resource manager

allocates the hardware resource data meeting the request to the thread in accordance with a rule

prescribed in advance. **Dearth et al.** ('824) teaches allocating a resource in which the resource

manager allocates the hardware resource data meeting the request to the thread in accordance

with a rule prescribed in advance (CL2, L46-48). It would have been obvious to one of ordinary

skill in the art at the time of Applicants' invention to modify the method of **Chen** with the

method of **Dearth et al.** ('824) that included allocating a resource in which the resource manager

allocates the hardware resource data meeting the request to the thread in accordance with a rule

prescribed in advance because when simulating a circuit using multiple concurrently executing

threads, often more than one thread would attempt to interact with the same simulated

component of the simulated circuit or device; and it would be necessary to avoid collisions in

multiple concurrently executing threads by reserving simulated devices to one or more

simulation threads (CL2, L30-33; Abstract, L1-3; CL4, L32-36).

   Chen teaches controlling a thread in which the thread manager controls an execution

state of the thread, the thread manager executing the requesting, allocating, and controlling

repeatedly until the execution of the thread reaches completion, for simulating the operation of

the logical unit to be conducted up to the completion (Fig 8 and Fig. 11). **Chen** does not

expressly teach controlling a thread in which the thread manager controls an execution state of

the thread in accordance with a result of the allocation made by the resource manager, the thread

manager and the resource manager executing the requesting, allocating, and controlling

repeatedly in cooperation with each other until the execution of the thread reaches completion

simulating the operation of the logical unit to be conducted up to the completion. **Dearth et al.**

('242) teaches controlling a thread in which the thread manager controls an execution state of the

thread in accordance with a result of the allocation made by the resource manager, the thread

manager and the resource manager executing the requesting, allocating, and controlling

repeatedly in cooperation with each other until the execution of the thread reaches completion

simulating the operation of the logical unit to be conducted up to the completion (Fig. 2; Abstract

L22-26).

Chen does not expressly teach dynamically allocating hardware resource data relating to

necessary hardware resources to the thread by the resource manager every time the generated

thread is executed. Levy et al. teaches dynamically allocating hardware resource data relating to

necessary hardware resources to the thread by the resource manager every time the generated

thread is executed (CL3, L11-15; CL3, L22-30; CL3, L35-45). It would have been obvious to

one of ordinary skill in the art at the time of Applicants' invention to modify the method of Chen

with the method of Levy et al. that included dynamically allocating hardware resource data

relating to necessary hardware resources to the thread by the resource manager every time the

generated thread is executed because that would support out-of-order execution of instructions

for the threads (CL3, L14-15) with dynamic scheduling of instructions thus improving the

performance of multithreaded processor (CL1, L38-41).

8.2   As per claim 3, Chen, Dearth et al. ('242), Dearth et al. ('824) and Levy et al. teach the

method of claim 1. Chen teaches that the series of functions are represented in a plurality of

sequential or concurrently executed threads (Fig. 8 and Fig 11).

8.3   As per claim 6, Chen, Dearth et al. ('242), Dearth et al. ('824) and Levy et al. teach the

method of claim 1. Chen does not expressly teach that the resource manager monitors resource

requests in the requesting a resource to make a decision on a resource request deadlock state

among a plurality of threads as a result of the monitoring. **Dearth et al.** ('824) teaches that the

resource manager monitors resource requests in the requesting a resource to make a decision on a

resource request deadlock state among a plurality of threads as a result of the monitoring

(Abstract, L3-7; CL2, L30-33; CL3, L1-6).

8.4   As per claim 13, **Chen** teaches an apparatus for simulating an operation of a logical unit

(CL1, L1-3; CL1, L12-15; CL3, L10-11; CL3, L18-20); comprising:

     Chen teaches a thread manager for controlling a thread forming an execution unit of a

program (Fig 8 and Fig. 11).

     Chen does not expressly teach a resource manager for managing hardware resource data

relating to a hardware resource needed for execution of the thread; and resource allocating means

for allocating hardware resource data relating to a hardware resource meeting the request to the

thread in accordance with a rule prescribed in advance. **Dearth et al.** ('824) teaches a resource

manager for managing hardware resource data relating to a hardware resource needed for

execution of the thread; and resource allocating means for allocating hardware resource data

relating to a hardware resource meeting the request to the thread in accordance with a rule

prescribed in advance (CL2, L46-48).

     Chen teaches a thread manager for execution of a thread representative of functions

required until the operation of the logical unit reaches completion according to a design

specification of the logical unit (Fig 8 and Fig. 11). **Chen** does not expressly teach resource

requesting means for making a request for hardware resource data relating to a hardware

resource needed for execution of a thread to the resource manager. **Dearth et al.** ('242) teaches

resource requesting means for making a request for hardware resource data relating to a

hardware resource needed for execution of a thread to the resource manager (Fig. 2, Item 202

and Item 130; Abstract L17-20).

      Chen teaches thread control means for controlling an execution state of the thread; and

the thread manager conducting the control of the thread execution state repeatedly in cooperation

with each other until the execution of the thread reaches completion, for simulating the operation

of the logical unit to be conducted up to the completion (Fig 8 and Fig. 11). **Chen** does not

expressly teach thread control means for controlling an execution state of the thread in

accordance with a result of a resource allocation made by the resource manager in response to

the request from the resource requesting means; and the thread manager and the resource

manager conducting the resource request and the control of the thread execution state repeatedly

in cooperation with each other. **Dearth et al.** ('242) teaches thread control means for controlling

an execution state of the thread in accordance with a result of a resource allocation made by the

resource manager in response to the request from the resource requesting means; and the thread

manager and the resource manager conducting the resource request and the control of the thread

execution state repeatedly in cooperation with each other (Fig. 2; Abstract L22-26).

      Chen does not expressly teach dynamically allocating hardware resource data relating to

necessary hardware resources to the thread by the resource manager every time the generated

thread is executed. **Levy et al.** teaches dynamically allocating hardware resource data relating to

necessary hardware resources to the thread by the resource manager every time the generated

thread is executed (CL3, L11-15; CL3, L22-30; CL3, L35-45).

8.5   As per Claim 14, it is rejected based on the same reasoning as Claim 13, supra. Claim 14

is a computer readable recording medium claim reciting the same limitations as Claim 13, as

taught throughout by **Chen, Dearth et al.** ('242), **Dearth et al.** ('824) and **Levy et al.**

8.6   As per Claims 17 and 35, these are rejected based on the same reasoning as Claim 6,

supra. Claims 17 and 35 are computer readable recording medium claims reciting the same

limitations as Claim 6, as taught throughout by **Chen, Dearth et al.** ('242), **Dearth et al.** ('824)

and **Levy et al.**

8.7   As per Claim 32, it is rejected based on the same reasoning as Claim 3, supra. Claim 32

is a computer readable recording medium claim reciting the same limitations as Claim 3, as

taught throughout by **Chen, Dearth et al.** ('242), **Dearth et al.** ('824) and **Levy et al.**

9.   Claims 2, 23 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Chen**

(U.S. Patent 6,466,898) in view of **Dearth et al.** (U.S. Patent 6,345,242), **Dearth et al.** (U.S.

Patent 5,812,824) and **Levy et al.** (U.S. Patent 6,092,175), and further in view of **Kinzelman et**

al. (U.S. Patent 5,594,741).

9.1   As per claim 2, **Chen, Dearth et al.** ('242), **Dearth et al.** ('824) and **Levy et al.** teach

the method of claim 1. **Chen** does not expressly teach that the series of functions are represented

in a plurality of sequential threads. **Kinzelman et al.** teaches that the series of functions are

represented in a plurality of sequential threads (CL8, L49-52; CL11, L13-17). It would have

been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the

method of **Chen** with the method of **Kinzelman et al.** that included the series of functions being

represented in a plurality of sequential threads because that would allow instruction threads to be

synchronized to align responder instructions from one transactor with the appropriate

commander instructions (CL8, L46-49).

9.2   As per claim 23, **Chen, Dearth et al.** ('242), **Dearth et al.** ('824) and **Levy et al.** teach

the computer readable medium of claim 14. **Chen** does not expressly teach that the series of

functions are represented in a plurality of sequential threads. **Kinzelman et al.** teaches that the

series of functions are represented in a plurality of sequential threads (CL8, L49-52; CL11, L13-

17).

9.3   As per claim 26, **Chen, Dearth et al.** ('242), **Dearth et al.** ('824), **Levy et al.** and

Kinzelman et al. teach the computer readable medium of claim 23. **Claim 26** has same

limitations as Claim 17.

10.   Claims 4, 5, 15, 16, 33 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable

over **Chen** (U.S. Patent 6,466,898) in view of **Dearth et al.** (U.S. Patent 6,345,242), **Dearth et**

al. (U.S. Patent 5,812,824) and **Levy et al.** (U.S. Patent 6,092,175), and further in view of **De Yong et al.** (U.S. Patent 5,355,435).

10.1   As per claim 4, **Chen, Dearth et al.** ('242), **Dearth et al.** ('824) and **Levy et al.** teach the method of claim 1. **Chen** does not expressly teach that a plurality of resource managers each corresponding to the resource manager are provided in conjunction with the types of the hardware resources data, and in the allocating a resource, each of the resource managers allocates the hardware resource data, the resource manager manages, to the thread in accordance with a local rule described in advance. **Dearth et al.** ('824) teaches that a resource manager is provided in conjunction with the types of the hardware resources data, and in the allocating a resource, the resource manager allocates the hardware resource data, the resource manager manages, to the thread in accordance with a local rule described in advance (Abstract, L1-9; CL1, L40-44; CL2, L46-48).

Chen does not expressly teach a plurality of resource managers each corresponding to the resource manager are provided in conjunction with the types of the hardware resources. **De Yong et al.** teaches a plurality of resource managers each corresponding to the resource manager are provided in conjunction with the types of the hardware resources (CL19, L35-36), because a plurality of hierarchical resource managers (arbitration systems) provide an ordered resolution of temporal contentions (CL19, L35-36). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **Chen** with the method of **De Yong et al.** that included a plurality of resource managers each corresponding to the resource manager are provided in conjunction with the types of the hardware resources. The artisan

would have been motivated because a plurality of hierarchical resource managers (arbitration systems) would provide an ordered resolution of temporal contentions.

10.2   As per claim 5, **Chen, Dearth et al.** ('242), **Dearth et al.** ('824) and **Levy et al.** teach the method of claim 1. **Chen** does not expressly teach a plurality of resource managers each corresponding to the resource manager are provided in conjunction with the types of the hardware resources data and are hierarchized according to the dependence among the hardware resources data, and in the resource allocating, the hardware resource data allocation is made in consideration of the dependence between the hardware resource data managed by one of the resource managers and the hardware resource managed by the other resource manager lower in hierarchy than the one of the resource managers. **De Yong et al.** teaches a plurality of resource managers each corresponding to the resource manager are provided in conjunction with the types of the hardware resources data and are hierarchized according to the dependence among the hardware resources data, and in the resource allocating, the hardware resource data allocation is made in consideration of the dependence between the hardware resource data managed by one of the resource managers and the hardware resource managed by the other resource manager lower in hierarchy than the one of the resource managers (CL19, L35-36). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **Chen** with the method of **De Yong et al.** that included a plurality of resource managers each corresponding to the resource manager would be provided in conjunction with the types of the hardware resources data and would be hierarchized according to the dependence among the hardware resources data, and in the resource allocating, the hardware resource data allocation

would be made in consideration of the dependence between the hardware resource data managed

by one of the resource managers and the hardware resource managed by the other resource

manager lower in hierarchy than the one of the resource managers because a plurality of

hierarchical resource managers (arbitration systems) would provide an ordered resolution of

temporal contentions (CL19, L35-36).

10.3   As per Claims 15, 16, 33 and 34, these are rejected based on the same reasoning as

Claims 4 and 5, supra. Claims 15, 16, 33 and 34 are a computer readable recording medium

claim reciting the same limitations as Claims 4 and 5, as taught throughout by **Chen, Dearth et**

al. ('242), Dearth et al. ('824), Levy et al. and **De Yong et al.**

11.   Claims 7, 18 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Chen**

(U.S. Patent 6,466,898) in view of **Dearth et al.** (U.S. Patent 6,345,242), **Dearth et al.** (U.S.

Patent 5,812,824) and **Levy et al.** (U.S. Patent 6,092,175), and further in view of **Thekkath et**

al. (U.S. Patent 6,490,642).

11.1   As per claim 7, **Chen, Dearth et al. ('242), Dearth et al. ('824)** and **Levy et al.** teach the

method of claim 1. **Chen** does not expressly teach that the resource manager monitors read/write

requests with respect to the hardware resource data allocated by the resource request in the

requesting a resource to make a decision on a competition state in read/write operation on the

hardware resource data among a plurality of threads on the basis of a result of the monitoring.

Dearth et al. ('824) teaches that the resource manager monitors requests with respect to the

hardware resource data allocated by the resource request in the requesting a resource to make a

decision on a competition state in operation on the hardware resource data among a plurality of

threads on the basis of a result of the monitoring (Abstract, L1-3; CL2, L30-33).

Chen does not expressly teach that the resource manager monitors read/write requests

with respect to the hardware resource data allocated by the resource request in the resource

requesting step to make a decision on a competition state in read/write operation on the hardware

resource data among a plurality of threads on the basis of a result of the monitoring. **Thekkath**

et al. teaches that the resource manager monitors read/write requests with respect to the

hardware resource data allocated by the resource request in the resource requesting step to make

a decision on a competition state in read/write operation on the hardware resource data among a

plurality of threads on the basis of a result of the monitoring (Abstract, L8-18; CL2, L23-34;

CL2, L48-64; CL6, L65 to CL7, L5; CL9, L53-59). It would have been obvious to one of

ordinary skill in the art at the time of Applicants' invention to modify the method of **Chen** with

the method of **Thekkath et al.** that included the resource manager monitoring read/write

requests with respect to the hardware resource data allocated by the resource request in the

resource requesting step to make a decision on a competition state in read/write operation on the

hardware resource data among a plurality of threads on the basis of a result of the monitoring

because that would allow improving the efficiency of data transfers between devices

interconnected over a system bus in a multi-master computer system configuration (Abstract, L1-

4).

11.2   As per Claims 18 and 36, it is rejected based on the same reasoning as Claim 7, <u>supra.</u>

Claims 18 and 36 are computer readable recording medium claims reciting the same limitations

as Claim 7, as taught throughout by **Chen, Dearth et al.** ('242), **Dearth et al.** ('824), **Levy et al.**

and **Thekkath et al.**

12.   Claims 8, 10, 19, 21, 37 and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable

over **Chen** (U.S. Patent 6,466,898) in view of **Dearth et al.** (U.S. Patent 6,345,242), **Dearth et**

al. (U.S. Patent 5,812,824) and **Levy et al.** (U.S. Patent 6,092,175), and further in view of

Markov (U.S. Patent 6,314,552).

12.1   As per claim 8, **Chen, Dearth et al.** ('242), **Dearth et al.** ('824) and **Levy et al.** teach the

method of claim 1. **Chen** does not expressly teach that the resource manager monitors the

number of resource requests with respect to the hardware resource data to detect a bottleneck on

the thread on the basis of a result of the monitoring. **Markov** teaches that the resource manager

monitors the number of resource requests with respect to the hardware resource data to detect a

bottleneck on the thread on the basis of a result of the monitoring (CL7, L27-34). It would have

been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the

method of **Chen** with the method of **Markov** that included the resource manager monitoring the

number of resource requests with respect to the hardware resource data to detect a bottleneck on

the thread on the basis of a result of the monitoring because that would allow the resource

manager to intervene and control the bottlenecks and allow evolutionary generation of candidate

architectures (CL6, L7-12).

12.2   As per claim 10, **Chen, Dearth et al.** ('242), **Dearth et al.** ('824) and **Levy et al.** teach

the method of claim 1. **Chen** does not expressly teach that the thread has a budget on a time of

occupancy of hardware resource data relating to a hardware resource allocated by the resource

manager. **Markov** teaches that the thread has a budget on a time of occupancy of hardware

resource data relating to a hardware resource allocated by the resource manager (CL7, L27-34).

12.3   As per Claims 19, 21, 37 and 39, these are rejected based on the same reasoning as

Claims 8 and 10, supra. Claims 19, 21, 37 and 39 are computer readable recording medium

claims reciting the same limitations as Claims 8 and 10, as taught throughout by **Chen, Dearth**

et al. ('242), **Dearth et al.** ('824), **Levy et al.** and **Markov**.

13.   Claims 9, 20 and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Chen**

(U.S. Patent 6,466,898) in view of **Dearth et al.** (U.S. Patent 6,345,242), **Dearth et al.** (U.S.

Patent 5,812,824) and **Levy et al.** (U.S. Patent 6,092,175), and further in view of **Markov** (U.S.

Patent 6,314,552) and **Kasuya** (U.S. Patent 6,077,304).

13.1   As per claim 9, **Chen, Dearth et al.** ('242), **Dearth et al.** ('824) and **Levy et al.** teach the

method of claim 1. **Chen** does not expressly teach that the resource manager monitors the

number of resource requests with respect to the hardware resource data to detect blocking of the

resource requests on the basis of a result of the monitoring. **Kasuya** teaches that the resource

manager monitors the number of resource requests with respect to the hardware resource data to

detect blocking of the resource requests on the basis of a result of the monitoring (Abstract, L12-

16). (CL6, L7-12). It would have been obvious to one of ordinary skill in the art at the time of

Applicants' invention to modify the method of **Chen** with the method of **Kasuya** that included

the resource manager monitoring the number of resource requests with respect to the hardware

resource data to detect blocking of the resource requests on the basis of a result of the monitoring

because as per **Markov** that would allow the resource manager to intervene and control the

blocking and allow evolutionary generation of candidate architectures.

13.2   As per Claims 20 and 38, these are rejected based on the same reasoning as Claim 9,

supra. Claims 20 and 38 are computer readable recording medium claims reciting the same

limitations as Claim 9, as taught throughout by **Chen, Dearth et al.** ('242), **Dearth et al.** ('824),

Levy et al., Markov and **Kasuya.**

14.   Claims 11, 22 and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over

Chen (U.S. Patent 6,466,898) in view of **Dearth et al.** (U.S. Patent 6,345,242), **Dearth et al.**

(U.S. Patent 5,812,824) and **Levy et al.** (U.S. Patent 6,092,175), and further in view of **Furuichi**

(U.S. Patent 5,437,037).

14.1   As per claim 11, **Chen, Dearth et al.** ('242), **Dearth et al.** ('824) and **Levy et al.** teach

the method of claim 1. **Chen** does not expressly teach that the thread has an execution time-limit

on the function. **Furuichi** teaches that the thread has an execution time-limit on the function

(CL2, L34-36). It would have been obvious to one of ordinary skill in the art at the time of

Applicants' invention to modify the method of **Chen** with the method of **Furuichi** that included

the thread having an execution time-limit on the function because as per **Dearth et al.** ('824) that

would allow collision in access to a simulated processor to be avoided by reserving the simulated

device to the concurrently executing threads for specific time period (Abstract, L1-3; CL2, L30-

33).

14.2   As per Claims 22 and 40, these are rejected based on the same reasoning as Claim 11,

supra. Claims 22 and 40 are computer readable recording medium claims reciting the same

limitations as Claim 11, as taught throughout by **Chen, Dearth et al.** ('242), **Dearth et al.**

('824), **Levy et al.** and **Furuichi.**

15.   Claims 12 and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Chen**

(U.S. Patent 6,466,898) in view of **Dearth et al.** (U.S. Patent 6,345,242), **Dearth et al.** (U.S.

Patent 5,812,824) and **Levy et al.** (U.S. Patent 6,092,175), and further in view of **Hollander**

(U.S. Patent 6,347,388).

15.1   As per claim 12, **Chen** teaches a method of simulating an operation of a logical unit

(CL1, L1-3; CL1, L12-15; CL3, L10-11; CL3, L18-20).

        Chen teaches a thread manager, which controls threads each forming an execution unit of

a program, for execution of each of a series of threads representative of functions required until

the operation of the logical unit reaches completion according to a design specification of the

logical unit (Fig 8 and Fig. 11). **Chen** does not expressly teach requesting a resource in which a

thread manager makes a request for hardware resource data relating to a hardware resource

needed for execution of each of a series of threads, to a resource manager which manages the

hardware resource data. **Dearth et al.** ('242) teaches requesting a resource in which a thread

manager makes a request for hardware resource data relating to a hardware resource needed for

execution of each of a series of threads, to a resource manager which manages the hardware

resource data (Fig. 2, Item 202 and Item 130; Abstract L17-20).

Chen does not expressly teach allocating a resource in which the resource manager

allocates the hardware resource data meeting the request to the thread in accordance with a rule

prescribed in advance. **Dearth et al.** ('824) teaches allocating a resource in which the resource

manager allocates the hardware resource data meeting the request to the thread in accordance

with a rule prescribed in advance (CL2, L46-48).

Chen teaches controlling a thread in which the thread manager controls an execution

state of the thread, the thread manager executing the requesting, allocating, and controlling

repeatedly until the execution of the thread reaches completion, for simulating the operation of

the logical unit to be conducted up to the completion (Fig 8 and Fig. 11). **Chen** does not

expressly teach controlling a thread in which the thread manager controls an execution state of

the thread in accordance with a result of the allocation made by the resource manager, the thread

manager and the resource manager executing the requesting, allocating, and controlling

repeatedly in cooperation with each other until the execution of the thread reaches completion

simulating the operation of the logical unit to be conducted up to the completion. **Dearth et al.**

('242) teaches controlling a thread in which the thread manager controls an execution state of the

thread in accordance with a result of the allocation made by the resource manager, the thread

manager and the resource manager executing the requesting, allocating, and controlling

repeatedly in cooperation with each other until the execution of the thread reaches completion

simulating the operation of the logical unit to be conducted up to the completion (Fig. 2; Abstract

L22-26).

Chen does not expressly teach dynamically allocating hardware resource data relating to

necessary hardware resources to the thread by the resource manager every time the generated

thread is executed. Levy et al. teaches dynamically allocating hardware resource data relating to

necessary hardware resources to the thread by the resource manager every time the generated

thread is executed (CL3, L11-15; CL3, L22-30; CL3, L35-45).

Chen does not expressly teach comparing a result of the simulation with an estimated

value on the operation of the logical unit. Hollander teaches comparing a result of the

simulation with an estimated value on the operation of the logical unit (CL1, L53-55; CL1, L66-

67). It would have been obvious to one of ordinary skill in the art at the time of Applicants'

invention to modify the method of Chen with the method of Hollander that included comparing

a result of the simulation with an estimated value on the operation of the logical unit because that

would allow the designer to determine whether a particular hardware and software combination

exactly implements the requirements defined by the IC's specification (CL1, L15-18).

Chen does not expressly teach outputting a result of the comparison to an external unit.

Hollander teaches outputting a result of the comparison to an external unit (CL2, L25-27; CL2,

L33-34).

15.2   As per Claim 41, it is rejected based on the same reasoning as Claim 12, supra. Claim 41

is a computer readable recording medium claim reciting the same limitations as Claim 11, as

taught throughout by **Chen, Dearth et al.** ('242), **Dearth et al.** ('824), **Levy et al.** and

Hollander.

16.   Claims 24 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Chen**

(U.S. Patent 6,466,898) in view of **Dearth et al.** (U.S. Patent 6,345,242), **Dearth et al.** (U.S.

Patent 5,812,824) and **Levy et al.** (U.S. Patent 6,092,175), and further in view of **Kinzelman et**

al. (U.S. Patent 5,594,741) and **De Yong et al.** (U.S. Patent 5,355,435)

16.1   As per claim 24, **Chen, Dearth et al.** ('242), **Dearth et al.** ('824), **Levy et al.** and

Kinzelman et al. teach the computer readable medium of claim 23. Claim 24 has same

limitation as claim 15, which is taught by **De Yong et al.**

16.2   As per claim 25, **Chen, Dearth et al.** ('242), **Dearth et al.** ('824), **Levy et al.** and

Kinzelman et al. teach the computer readable medium of claim 23. Claim 25 has same

limitation as claim 16, which is taught by **De Yong et al.**

17.   Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Chen** (U.S.

Patent 6,466,898) in view of **Dearth et al.** (U.S. Patent 6,345,242), **Dearth et al.** (U.S. Patent

5,812,824) and **Levy et al.** (U.S. Patent 6,092,175), and further in view of **Kinzelman et al.**

(U.S. Patent 5,594,741) and **Thekkath et al.** (U.S. Patent 6,490,642).

17.1   As per claim 27, **Chen, Dearth et al.** ('242), **Dearth et al.** ('824), **Levy et al.** and

Kinzelman et al. teach the computer readable medium of claim 23. Claim 27 has same

limitation as claim 18, which is taught by **Thekkath et al.**

18.   Claims 28 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Chen**

(U.S. Patent 6,466,898) in view of **Dearth et al.** (U.S. Patent 6,345,242), and **Dearth et al.** (U.S.

Patent 5,812,824), and further in view of **Kinzelman et al.** (U.S. Patent 5,594,741) and **Markov**

(U.S. Patent 6,314,552).

18.1   As per claims 28 and 30, **Chen, Dearth et al.** ('242), **Dearth et al.** ('824), **Levy et al.**

and **Kinzelman et al.** teach the computer readable medium of claim 23. claims 28 and 30 have

same limitations as claim 8 and 10, which are taught by **Markov.**

19.   Claim 29 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Chen** (U.S.

Patent 6,466,898) in view of **Dearth et al.** (U.S. Patent 6,345,242), **Dearth et al.** (U.S. Patent

5,812,824) and **Levy et al.** (U.S. Patent 6,092,175), and further in view of **Kinzelman et al.**

(U.S. Patent 5,594,741), **Markov** (U.S. Patent 6,314,552) and **Kasuya** (U.S. Patent 6,077,304).

19.1   As per claim 29, **Chen, Dearth et al.** ('242), **Dearth et al.** ('824), **Levy et al.** and

Kinzelman et al. teach the computer readable medium of claim 23. Claim 29 has same

limitation as claim 20, which is taught by **Markov and Kasuya.**

20.   Claim 31 is are rejected under 35 U.S.C. 103(a) as being unpatentable over **Chen** (U.S.

Patent 6,466,898) in view of **Dearth et al.** (U.S. Patent 6,345,242), **Dearth et al.** (U.S. Patent

5,812,824) and **Levy et al.** (U.S. Patent 6,092,175), and further in view of **Kinzelman et al.**

(U.S. Patent 5,594,741) and **Furuichi** (U.S. Patent 5,437,037).

20.1   As per claim 31, **Chen, Dearth et al.** ('242), **Dearth et al.** ('824), **Levy et al.** and

Kinzelman et al. teach the computer readable medium of claim 23. Claim 31 has same

limitation as claim 22, which is taught by **Furuichi.**

Response to Arguments

21.   Applicants' arguments filed on December 1, 2005 have been fully considered. The

arguments with respect to 103 (a) rejections are not persuasive.

21.1   As per the applicants' argument that "Independent claims 1, 12, 13, 14, and 41 (all as

amended) respectively recite a method ... using claim 1 as an example, "requesting a resource in

which a thread manager, which controls threads each forming an execution unit of a program,

makes a request a request for hardware resource data relating to a hardware resource ... to a

resource manager which manages said hardware resource data; allocating a resource in which

said resource manager allocates said hardware resource data . . . while dynamically allocating

hardware resource data relating to necessary hardware resources"; none of the cited art, alone or

in combination, teaches such a request for hardware resource data and dynamically allocating

hardware resource data; the Examiner contends that Levy et al. teaches dynamically allocating

necessary hardware resources to the thread by said resource manager every time the generated

thread is executed; Levy does not teach allocating of data, as recited in each of the independent

claims; Levy merely discusses that a renaming of actual registers, that is real hardware resources,

and not data, are dynamically allocatable and assignable to different threads at different times and are

thus shared between the threads; Levy does not teach a technique of a simulation of a logical

unit; accordingly, none of the cited art, alone or in an *arguendo* combination teaches a simulation

using hardware resource data relating to necessary hardware resources as recited in each of the

independent claims", the examiner respectfully disagrees.

The applicants have introduced the term "hardware resource data" in this amendment.

However, such a term was not used in the original application and hence is new material

introduced, which is not allowed at this stage of prosecution.

In addition, in any simulation, the real hardware will be assigned for executing the

threads. The resource manager does not assign data but the resources, as one of ordinary skill in

the art will understand. The **Dearth et al.** ('242), and **Dearth et al.** ('824) references use

distributed simulation assign the resources to multiple threads in distributed simulation. The

resources allocated are real resources and not data. The resources are allocated dynamically in

any multithreaded operation, as the resource requirements continuously change as the execution

progresses. The Examiner used the **Levy** reference to show that the resource is dynamically

allocated as the real time conditions change. Therefore, there is no difference between what the

applicants are claiming and what the **Dearth et al.** ('242), and **Dearth et al.** ('824) references

teach for the simulation.

21.2   As per the applicants' argument that "the Examiner contends it would have been obvious

to modify the method of Chen with the method of Levy because that would support out-of-order

execution of instructions . . . thus improving the performance of multithreaded processor;

Applicants submit there is no motivation or reasonable chance of success to modify the HDL of Cohen

with Levy; Levy discusses "renaming registers are dynamically allocatable and assignable to

different threads at different times and are thus shared between the threads"; however, Cohen, for

example, discusses "to ensure the multithreaded simulator provided by the invention capable of

minimizing these overheads, a variety of following methods are employed . . . keep the threads

"alive" and be bound to hardware CPU as long as possible; there is no motivation to modify the

HDL code of Cohen with Levy as the Examiner contends.", the examiner respectfully disagrees.

Applicants' attention is directed to paragraph 21.1 above.
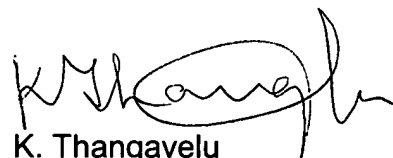
Conclusion

22.   Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Dr. Kandasamy Thangavelu whose telephone number is

571-272-3717. The examiner can normally be reached on Monday through Friday from

8:00 AM to 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo Picard, can be reached on 571-272-3749. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to TC 2100 Group receptionist: 571-272-2100.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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